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ABSTRACT

The goals of this curriculum, developed as a summer course for the Young Scholars Program at The Ohio State University-Columbus, are as follows: (1) enable students to develop an understanding of the concept of a system; (2) help students gain an appreciation of the value of systems; (3) develop skills in working with systems; (4) expand skills in doing science; and (5) explore science as a field of study. Background information is organized into the following sections: (1) Safety in Systems; (2) Engineering a Bridge; (3) The Ultimate Survey; (4) Genetics; and (5) Toxic Wastes in Systems. Activities and field trips are intertwined in this two-week unified science course that also includes an opening section about learning styles. Among the topics for the activities are laboratory safety, making carbon dioxide, bridge building, survey research, limiting toxic waste mobility, and identifying human genetic traits. Data sheets are also included for many of the activities. (DDR)

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UNIFIED SCIENCE - SYSTEM

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Dr. Barbara S. Thomson
Unified Science - System
Young Scholar's Program

July,
The Ohio State University

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UNIFIED SCIENCE - SYSTEM

A TENTATIVE AGENDA FOR THE YOUNG SCHOLARS PROGRAM

JULY 19 - 30, 1993

WEEK 1

Monday, July 19, 1993
- Introduction to System
- Name Cards
- What's Your Learning Style? (L.S.I.)
- Styles and You (Psychology)
- Learning Styles Rap
- Safety in Systems (homework)

Tuesday, July 20, 1993
- Preparation Activities for COSI
- Distribute Booklets on the Brain you You.
- Use COSI/OSU Lab Activities
- Previsit Introduction to Brain
- Read and Outline Brain Booklet
- Quiz on Safety (Homework)

Wednesday, July 21, 1993
- Introduction to Bridge Building (Engineering)
- Tacoma Narrows Collapse (Video)
- COSI Preparation
- Write up COSI Summary (homework)

Thursday, July 22, 1993
- Introduction to The Food Preference Survery
- Role Play and Materials.
- (Sociology)
- COSI Debriefing

Friday, July 23, 1993
- Toxic Waste--What Can We Do?
- (Chemistry, Environmental, Englineering, Physics)

Week 2

Monday, July 26, 1993
- Looking at Systems
- Submit Food Preference Survey Data
- Review Bridge Activity/Questions/Status

EXAM over first week

Tuesday, July 27, 1993
- Preparation for the Columbus Zoo
- Discovery Reef: A Coral Reef dAtoll
- (Develop Questions to use at Zoo -- Homework)
- A Columbus Zoo Investigation: Animal Behaviors
- Simulated Habitats (Zoology)
- Simulated Habitat Design (Homework)

Wednesday, July 28, 1993
- Human Genetic Traits (Genetics)
- The Inherited System
- Collect and label bridges
- Genetics (Homework)
- Coral Reef/Habitat Quiz

Thursday, July 29, 1993
- The Great Bridge Collapse
- A Media Event

Friday, July 30, 1993
- Closure Day for Unified Science
- What does the concept system mean to you?
  (Writing Opportunity)
- EXAM and Evaluation Day
- Video
- Tape Reruns of YSP - Unified Science Summer, '93

Have A Great Rest of the Year!

UNDERSTANDING THE CONCEPT OF SYSTEM WILL HELP YOU MANAGE YOUR OWN SYSTEM AS WELL AS THE SYSTEMS YOU INTERACT WITH ON A DAILY BASIS. YOU WILL BEGIN TO SEE SYSTEMS EVERYWHERE. BE A GOOD OBSERVER AND YOU WILL BE ABLE TO IDENTIFY AND MANAGE THESE SYSTEMS MORE EFFECTIVELY.

YOUNG SCHOLARS PROGRAM
ROOM ASSIGNMENTS
THE NEW CHEMISTRY BUILDING

ROOM #	FACULTY
CHEM #310	Rajeevk Swami
CHEM #320	Renee Pearson
CHEM #330	Lisa Barber
CHEM #340	Mae Welch
CHEM #350	Bob Reynolds
CHEM #360	Clifford Hooks

SUPPORTING FACULTY

Douglas Grieble
Shelly Riggs
Dan Riggs
Carol Bowman

Research Assistant in Science

Cynthia Veal

UNIFIED SCIENCE-THE CONCEPT OF SYSTEM

Rationale

Systems and subsystems surround us. Systems are an important part of our everyday lives. Identifying and managing systems will help us in our day to day living. This program helps us look at various systems and learn some skills to analyze these systems. Systems are everywhere and using a system appropriately will help us in many different ways.

Understanding system as a concept will help you to see systems in your own life. Humans need to learn to identify the systems which impact their lives. The car won't start, you are tired all the time, you don't have time to do the things which need to be done, or you can't gain the weight you need to be on the team. All of these challenges illustrate that something in a system is not working quite right. Being a systems detective will help you analyze the data and solve the problem. Being aware of system as a concept and using science skills to work within the system will really make your life easier and more fun. Discover how the concept of system is everywhere in your world and how you can use it.

Life gets tougher as we grow up. Understanding the world around us and discovering how to function in this world makes it easier. Science helps us make decisions in this world. Making the right decisions is really important. Using data to make these decisions is part of science. Looking at the total picture is also crucial. Looking at each system with which we interact helps us make decisions which are right for us. Identifying systems in our lives and using science skills as we make decisions will make our lives better. These next two weeks will give you science skills which will help you everyday. Let's look at systems and get started.

Goals and Objectives

GOALS	OBJECTIVES
As a result of this unit, you will	You will know you are making progress when you can
1. Develop your understanding of the concept of system.	1a. Operationally define system..
	1b. Give examples of systems.
	1c. Identify systems in your daily environment.
	1d.
2. Gain an appreciation of the value of systems.	2a. Identify ways system is important in our lives.
	2b. Tell a friend how systems are valuable.
	2c.
3. Develop skill in working with systems.	3a. Obtain data useful in comparing systems.
	3b. Use apparatus associated with systems.
	3c. Measure some characteristics of system.
	3d.
4. Expand your skills	4a. Interpret data

in doing science.	
	4b. Communicate results of data oriented investigations.
	4c. Ask appropriate questions.
	4d.
5. Enhance your interests in pursuing science as a field of study.	5a. Give an example of science related careers which relates to system.
	5b. Give parents and friends reasons for majoring in science.
	5c. Give examples of things you learned outside the formal classes.
	5d.

SAFETY IN SYSTEMS

SAFETY IN SYSTEMS

PROBLEM: How can you be safe in the lab?

MATERIALS:
Paper
Pencil
Graph Paper

PROCEDURE:

1. Draw a diagram of the laboratory using graph paper.

2. Place an "X" where you have any safety equipment.

3. Where are you working in the lab? Place your initials there.

4. Mark the exit routes with a dotted line. Do you have more than one exit route?

5. Make a list of the safety equipment available in the lab. Tell the purpose of each piece of safety equipment.

SAFETY EQUIPMENT	PURPOSE OF EQUIPMENT
1.	
2.	
3.	
4.	
5.	

THE DANCE OF THE CALIFORNIA RAISINS

LAB SHEET FOR SCIENCE TOOLS AND SAFETY

MATERIALS:
water
vinegar
goggles
graduated cylinder
baking soda
scales
raisins
macaroni

PROCEDURE:

1. Follow the laboratory sheet directions. Complete the questions.

2. Why is there a system of safety in a laboratory?

Name _____ Room number_____

Lab Sheet: Science Tools and Safety

Dance of the California Raisins

1. Measure 100 ml. of water. (Use graduated cylinder). Pour into large beaker.Pour slowly and carefully. Don"t spill or splash chemicals on self or clothes.

2. Put on goggles to measure 25 ml. of vinegar. (Goggles help to protect eyes when using chemicals). Use graduated cylinder. Pour carefully into large beaker containing water.

3. Measure out 20 grams of baking soda. Use scale for measuring dry measure. Add carefully to large beaker. As the reaction begins, add the raisins and macaroni.

4. Observe and record what happens.

---

1. Look at the clock. Watch the beaker carefully. How long before something happens?

_____

2. What is happening?

_____

3. Where are the bubbles forming?

_____

4. What do you think caused the bubbles to form?

_____

5. Which moves faster, macaroni or raisins? Why?

_____

Draw a picture of the experiment.

MAKING CARBON DIOXIDE

NAME_____

1. TOPIC_____

2.MATERIALS: POP BOTTLE, BALLOON, BAKING SODA, VINEGAR, SAFETY GLASSES, MEASURING EQUIPMENT- GRADUATED CYLINDER, SCALE, SPOONS, FUNNEL, PAPER TOWELS, MATCHES (SEE TEACHER)

3.PROCEDURE-

A. PUT ON GOGGLES TO MEASURE VINEGAR. GOGGLES HELP TO PROTECT EYES WHEN USING CHEMICALS. USE GRADUATED CYLINDER TO MEASURE 25 MILLILITERS OF VINEGAR INTO LARGE FLASK OR POP BOTTLE.

B.MEASURE OUT 20 GRAMS OF BAKING SODA (OR 25 ML). USE SCALES TO MEASURE DRY ITEMS. INSERT FUNNEL INTO BALLOON. CAREFULLY, POUR BAKING SODA INTO THE BALLOON.

C. LAY BALLOON ON SIDE. PUT THE NECK OF THE BALLOON OVER THE TOP OF THE BOTTLE.

D. GENTLY TAP THE BAKING SODA INTO THE BOTTLE.WATCH WHAT HAPPENS TO THE MIXTURE AND THE BALLOON.

E. COLLECT THE AIR INSIDE THE BALLOON BY TWISTING THE NECK OF THE BOTTLE. REMOVE THE BALLOON FROM THE BOTTLE CAREFULLY SO THE AIR DOES NOT ESCAPE.

F. RAISE YOUR HAND FOR YOUR TEACHER, AND WATCH WHAT HAPPENS WHEN THE AIR INSIDE THE BALLOON IS RELEASED NEAR A FLAME. YOUR TEACHER WILL CREATE THE FLAME FOR YOU.

4. OBSERVATIONS_____

_____

_____

5. DO YOU KNOW WHAT KIND OF GAS IS CREATED BY THE VINEGAR AND AKING SODA MIXTURE?_____

6. HOW WOULD THIS GAS BE HELPFUL IN FIGHTING FIRES?

_____

7.WHAT DO WE CALL THE CONTAINERS THAT PUT OUT SMALLL FIRES?

_____

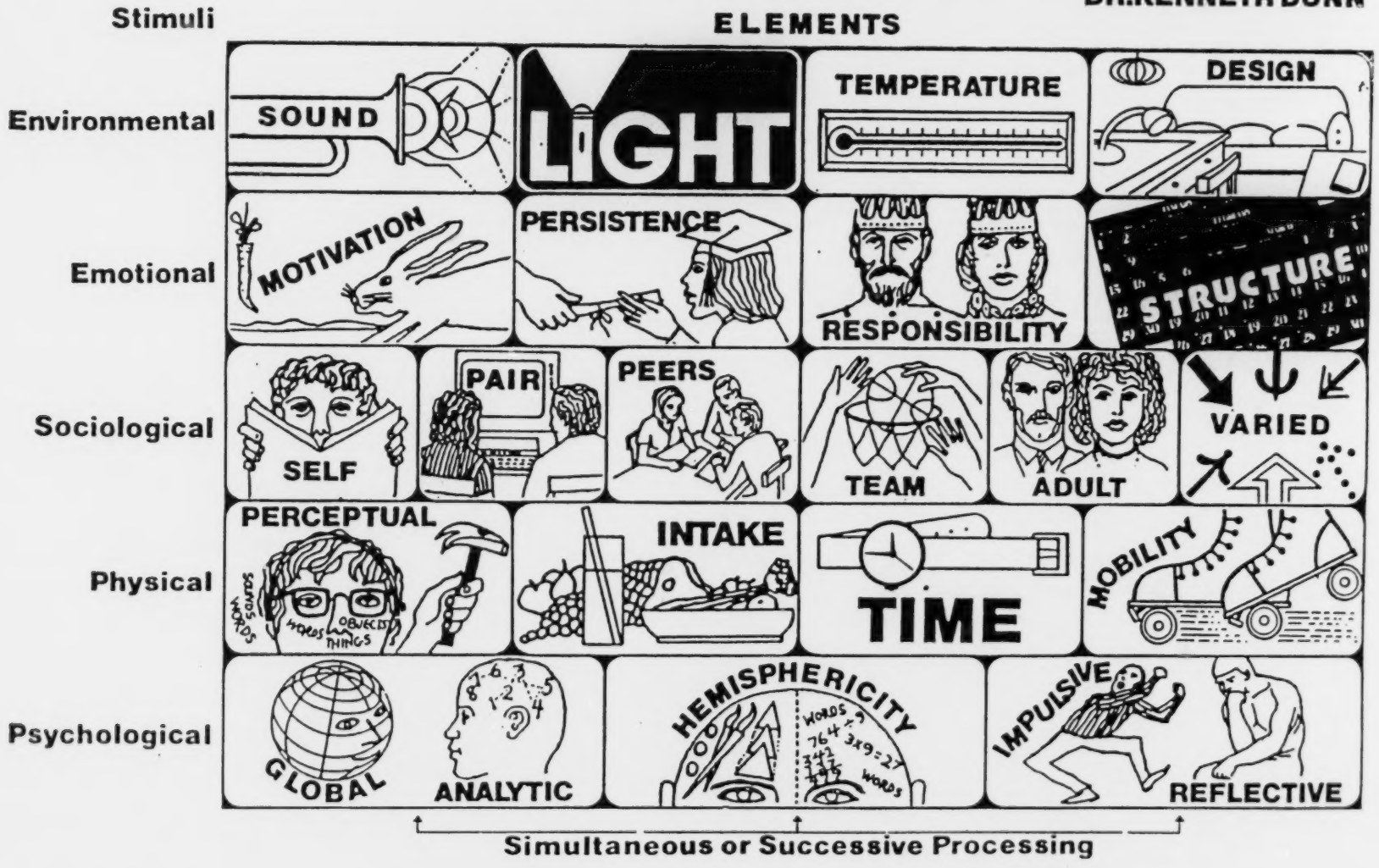
ON A PIECE OF PAPER, LIST 5 CHARACTERISTICS OF GASES.

WHAT'S YOUR STYLE ?

LEARNING IS A MATTER OF STYLE

LEARNING STYLES MODEL

DESIGNED BY
DR. RITA DUNN
DR. KENNETH DUNN



WHAT'S YOUR STYLE?

LEARNING IS A MATTER OF STYLE

PROBLEM: Why is my learning style important to me in school and in life?

MATERIALS:
Clip Board
Pencil
Learning Style Inventory
Video

PROCEDURE

Everybody has learning strengths. However, learning in school sometimes focuses on only certain strengths which may be in your weak area. How can you take your learning strengths and create a positive climate for your learning? Using the Learning Style Inventory we shall look at the human system which involves the brain and how we learn. Scientists want to help you capitalize on your personal strengths. Research shows that everyone has strengths although we differ from each other in our strengths. Even within families you will see major differences in the way family members learn.

Learning is more than simply hearing, seeing, and memorizing. Learning style is the way each learner concentrates, processes, and retains new and difficult information. Understanding learning patterns will help you determine your own processing style and assist your long term memory. What are your learning style strengths? This activity will look at your learning system as well as your friends. Use your strengths to increase your skills. It really works. We are all different but all have strengths that we can use.

Take the learning style inventory. Follow the directions and take your time to complete the questions.

Listen to the presentation your teacher will make in class. Are there some simple things you can do to use your learning strengths?

Listen and look at the video carefully. These are young scholars who became scholars because they emphasized their strengths in all of their classes. Everyone has certain learning styles. What are your style strengths? These are part of your system.

Learning Styles Network

The Center for the Study of Learning and Teaching Styles

Learning Styles

A Guide for High School Students

Text by Mary S. Burgess
Drawings by Loretta Kemmler

School of Education and Human Services, St. John's University
Grand Central and Utopia Parkways, Jamaica, New York 11439

Co-sponsored by the National Association of Secondary School Principals and St. John's University

Learning Styles

A Guide for High School Students

You were born curious, wanting to learn. You were driven to learn just because you're human. Human beings survive because they understand and remember, the twin elements of learning. If you now appear to be "lazy", it probably means you have somehow been turned off to learning. You can be turned on again if you discover your learning style.

Like the uniqueness of your fingerprint, the way you learn may also be one-of-a-kind. Many researchers today are investigating the mysterious business of how we learn. One college professor examined how people recall information while they play "Trivial Pursuit". He discovered that although some cues are used by many people, the combination of cues and the strengths of each person seems to produce an individualized pattern.

Your learning style is affected by factors in the environment, other people, your emotions, perception (how you take in and process information), and hemisphericity.

Hemisphericity refers to the dominance of the right and left sides of the brain. No one functions normally with just half a brain. We need both sides, or hemispheres, to think, feel, receive information, generate ideas and language, and perform other mental functions. However, the way each person learns seems to be controlled--or dominated--by one hemisphere or the other. Left-brained people learn better if information is presented in sequence, step by step. These learners are called analytic.

Right-brained people learn better if they can grasp a sense of the whole idea at once. These are global learners.

We all learn difficult material most easily when several "senses" are involved. But some people excel when material is presented visually (through seeing); others learn auditorily (through hearing). Some learners prefer learning through the tactile sense (touching) or kinesthetically--by moving. If a person is not strong in one sensory area, he or she often compensates by relying on a stronger area. For instance, a person who may be a weak auditory learner often needs to see and hear information. This person also may benefit from learning note-taking skills and then having something visual to help recall the information later.

Sound can be very distracting for some students. Wearing disconnected headphones to block out sound may be a solution in a noisy classroom or house. For other people, sound, such as music, actually aids concentration. Wearing connected headphones (to a Walkman or cassette player) will work for an other type of learner. If you believe strongly that sound will benefit you, and if your parents or teachers disagree, perhaps you can arrange to study with sound for one marking period. If your grades improve, your point may be proven.

Your working space should not be so warm or cold that discomfort is a distraction to you. Temperatures above 75 degrees make most people--not all--sluggish and sleepy when they are concentrating. But put a sweater on or take it off if

you can't control the thermostat and are uncomfortable. Where you learn best--sitting at a table or desk or lounging on the floor, bed, or soft chair--may be part of your learning style. So, too, may be your preference for dim or bright light.

Some students work best alone in their own room or in a study carrel in the library or classroom. Others need the interaction with a teacher and/or peers. Some may do homework in the midst of a family setting, such as at the kitchen or dining-room table. If they are peer-oriented, they may benefit from working with a friend.

Success when working with a parent depends on the relationship. If you think of your parent as a helper, part-time assistance may be beneficial. Your parent should not have to guide (force?) you every step of the way. On the other hand, parents can help you get organized, keep you on task (if you need that), ask questions when reviewing, hear vocabulary words and definitions, and help to establish time limits.

You already may know some of the things which help you learn. Your teacher may be able to guide you to special materials or a learning style test to determine your preferences. Whatever your learning style is, it is neither right nor wrong. It is yours, to be used to help you learn most efficiently. Use it! -- and good luck!

(Text by Mary S. Burgess, Drawings by Loretta Kemmler)

BEST COPY AVAILABLE

DISCOVERY REEF

A

CORAL REEF ATOLL

IN

COLUMBUS

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Going, Going, Gone!

The Fragile and Fabulous

Coral Reef Atoll

Coral reefs are beautiful and filled with a variety of life. Reefs are so diverse they are similar to the remarkable rainforests which are also in danger of disappearing. coral reefs are often referred to as an aquatic rainforest.

The Columbus Zoo has prepared video which explores coral reefs and explains the atoll. All of us will then be able to move into the coral reef area and view eye ball to eye ball the organisms of the deep. Be ready for a unique experience.

More than 1400 simulated corals (soft and hard) were developed to assure a habit which looks identical to living corals.

Prior to going to The Columbus Zoo you need to develop some questions you may want to explore during your Discovery Reef exposure. Develop 3 questions you would like to ask during your time at Discovery Reef.

Materials:

graph paper
pencil
clip board
paper

Procedure:

1. We are going to the Columbus Zoo. We are studying how a zoo attempts to create an environment for wild animals in an enclosed setting.

2. What kind of system is necessary for captive animals? Is it different for all animals?

3. Why are animals kept alone in some compounds and in groups in other compounds?

4. Can you create an appropriate environment for an animal? You are going to learn many interesting things about creating an environment for captive animals. What kind of environment will you design?

This activity will give you an opportunity to design a habitat for a large mammal where it will live in a zoo for the rest of its life. Select a large mammal such as a panda, elephant, lion, tiger, cheetah, wolf, gorilla, or a human. What size enclosure is necessary? What are the environmental, sociological, psychological, and physiological needs of your chosen mammal? How might you discover their needs? How do scientists learn about the needs of animals when they can't interview them?

Use your graph paper to design the enclosure and be sure to put the size needed. Remember to think about the public who want to see this animal. This is a challenge. Write your specifications for the variables in a paper. Once you have identified the animals needs, describe how you would create a simulated habitat at the Columbus Zoo for your animals.

Describe several challenges your animal will have when it arrives from its natural habitat to live in your newly designed enclosure at the Columbus Zoo. How has your design tried to avoid problems for this animal. Remember to discuss the environmental, psychological, sociological, and physiological variables. Many of these variables will be discussed at the zoo by your teachers, found on signage around the zoo, or presented by zoo educators during their presentations. Be observant and remember that your animal will be living in your design for the rest of its life.

The Columbus Zoo provides simulated habitats for a wide variety of animals. Keeping the animals healthy and visitors safe are two additional variables to review. Be observant as you tour the zoo with your group. Ask Docents in red jackets questions you have as they are very intelligent and knowledgeable about the animals in the zoo. You will find Docents in many places around the zoo grounds and they are eager to talk with you about the animals. The Columbus Zoo is one of the top ten zoos in the world. We are fortunate to have this opportunity to learn and discover. Enjoy this unique experience.

THERE'S NO PLACE LIKE HOME ?

INTRODUCTION: Sometime during the course of this week, you will be studying and designing a habitat for a particular animal moved from its' natural environment to captivity. At this moment, you are an animal moved from its' natural environment (home) and you are being held "captive" by the Young Scholar's Summer Institute.\ This exercise will ask you to start your study about habitats by having you compare your own bedroom (natural environment) to your dorm (captivity).

MATERIALS:

paper
pencil
graph paper

PROCEDURE:

1. Using graph paper and pencil, draw a diagram of your bedroom at home and another diagram of your dorm room.

2. Write a brief description of both rooms and tell how they are the same or different. How would you change the dorm to make it more like home?

ENGINEERING A BRIDGE

OR

THE GREAT BRIDGE BUILDING CONTEST

ENGINEERING A BRIDGE
OR
THE GREAT BRIDGE BUILDING CONTEST

PROBLEM: Can I build a bridge?

MATERIALS
a partner
two packages toothpicks
one container of bridge glue
waxed paper
paper towels
enthusiasm and creative thinking

INTRODUCTION

1. You will view a film about a well engineered bridge A bridge not only saves time in allowing a more direct route but it also saves petroleum resources in motor vehicles. A well engineered bridge can be useful for more than half a century and utilizes natural and technological resources only once during that time instead of requiring numerous bridge replacements and disruption of natural systems during the bridge construction.

2. How does one build a bridge? Which variables are important? How important is the way the bridge looks? Is the weight it will carry important?

3. Is there more than one way to build a bridge? Use your Bridge Building Activity Sheet to provide you with some assistance. Check your schedule for the contest day.

ENGINEERING A BRIDGE
OR
THE GREAT BRIDGE BUILDING CONTEST

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A bridge not only saves time in allowing a more direct route but it also saves petroleum resources in motor vehicles. A well engineered bridge can be useful for more than half a century and utilizes natural and technological resources only once during that time instead of requiring numerous bridge replacements and disruption of natural systems during the bridge construction.

2. How does one build a bridge? Which variables are important? How important is the way the bridge looks? Is the weight it will carry important?

3. Is there more than one way to build a bridge? Use your Bridge Building Activity Sheet to provide you with some assistance. Check your schedule for the contest day.

Procedures

Divide the class into pairs for this activity. Collaboration is very helpful in designing a structural model. Gifted students may want to work alone and this should be approved since this behavior is typical of gifted learners. Each pair will receive one set of materials and may not augment their bridge with additional materials. The question may arise if they might use the cardboard from the toothpick containers. That is all right but do not suggest it. The more gifted learners who are also creative usually ask this question.

This activity requires planning and designing strategies. The learners care challenged to build the best possible structure which will be tested for strength. The pictures may be useful and a discussion might be held to explore the different models. However, learners should not be limited to these models. They may have a more effective structure they would like to evaluate.

Students in cooperation with the teacher will also as a class design a way to test the strength of the bridges. A guide to test the bridge is discussed below but students may want to create a different way for each bridge to be tested. They also need to know that the bridges will be tested until they fracture. Some students may not want their bridge destroyed and will decide not to participate in the final contest.

Rules for the Contest:

1. The bridge must be built of materials supplied by the instructor (two boxes of toothpicks and one container of Borden's carpenter's glue)
2. The bridge must span one foot. This means that the bridge will have to be longer than a foot to be supported on either end.
3. The bridge must have provisions to be tested built into it. The test will consist of weights suspended from a block of wood. The block will be 1" x 2" x 4" and will be placed crosswise at the center of the span. The weights will be

suspended on a rope hanging below the block and below the bridge.

4. The winner will be based on the ratio of bridge weight to weight supported. This means that a light bridge may hold less weight than a heavy bridge but win because of the bridge weight to suspended weight ratio.

5. It should be noted that to test the bridge it will be necessary to destroy it. Otherwise the weight cannot be determined. Students who become attached to their bridges and do not want to destroy them may withdraw their bridge from the contest after their bridge has achieved a 10 to one suspended weight to bridge weight ratio.

Discussion area prior to starting this project are:

1. Look at geometric figures? Which seem to be the strongest and most stable? Which ones appear most frequently in real construction projects? Do most bridges have triangles in the framework?

2. Try to plan how you want to build your bridge in advance. Sketch how you want it to look. The glue will dry in several hours so additional work can be done. However, the glue will be weak and tacky unless it has dried overnight.

3. MAKE SURE ALL OF YOUR GLUING IS OVER THE WAX PAPER PROVIDED. If you need additional wax paper see your teacher.

Bridge Building Activity

On your way here you probably crossed a number of bridges. We use bridges frequently without looking at them, yet there are different ways bridges are built and sometimes they are used for jobs other than allowing people to get from one place to another.

Can you think of 3 uses for bridges?

1. _____

2. _____

3. _____

How do you think the purpose of the bridge affect its design? As you travel around Ohio look at bridges and think about this question.

Many people think suspension bridges like the Golden Gate Bridge are the most beautiful type of bridge. Why do you think we have suspension bridges?

Bridge Building Contest

We will be building bridges from simple materials. Near the end of this course we will test the bridges for strength compared to the weight of the bridge. Prizes will be awarded for the strongest bridges. The bridges are to be built of toothpicks glued together. We will build the bridges in teams of two. You will have about a week to complete the bridge. Plan ahead so the glue can dry overnight before the bridge is tested.

Rules for the contest:

1. The bridge must be built of materials supplied by the instructor-toothpicks and glue. 2 boxes of toothpicks and one container of glue.
2. The bridge must span 1 foot. This means that the bridge will have to be longer than a foot to be supported on either end.
3. The bridge must have provisions to be tested built into it. The test will consist of weights suspended from a block of wood. The block will be 1"X2"X4" and will be placed

cross-wise at the center of the span. The weights will be suspended on a rope hanging below the block and below the bridge.

4. The winner will be based on the ratio of bridge weight to weight supported. This means that a light bridge may hold less weight than a heavy bridge but win because of the bridge weight to suspended weight ratio.

5. It should be noted that to test the bridge it will be necessary to destroy it. Otherwise the weight at which it will fail cannot be determined. Students who become attached to their bridges and do not want to destroy them may withdraw their bridge from the contest after their bridge has achieved a 10 to one suspended weight to bridge weight ratio.

Notes:

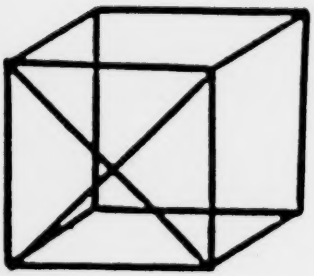
1. Look at geometric figures, which seem to be the strongest and most stable? Which ones appear most frequently in real construction projects? Most construction uses triangles in building a framework.

2. Try to plan how you want to build your bridge in advance. Sketch what you want it to look like and go from there. The glue should be dry enough in several hours to do additional work but it will be weak and tacky unless it has dried overnight.

3. MAKE SURE ALL OF YOUR GLUING IS OVER THE WAX PAPER PROVIDED. If you need additional wax paper see your instructor.

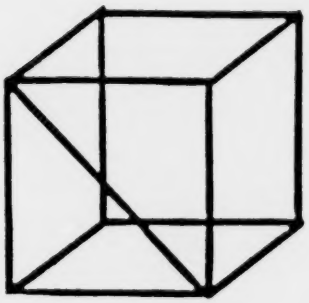
USEFUL DESIGNS

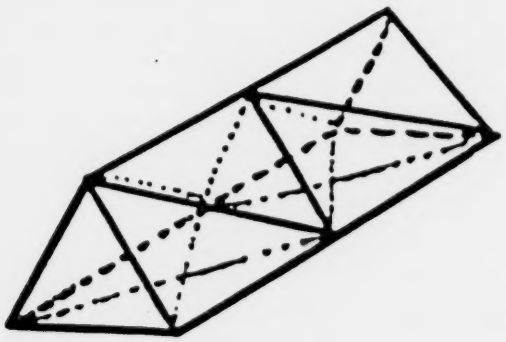
Please feel free to make use of any or all of the designs below in constructing your bridge. Remember, all shapes are constructed with toothpicks.



X-Pattern

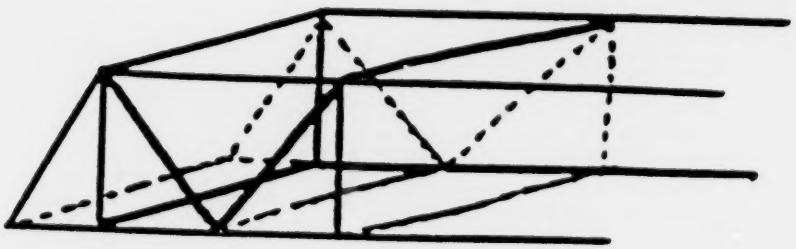
These cross members go on each face of the cube



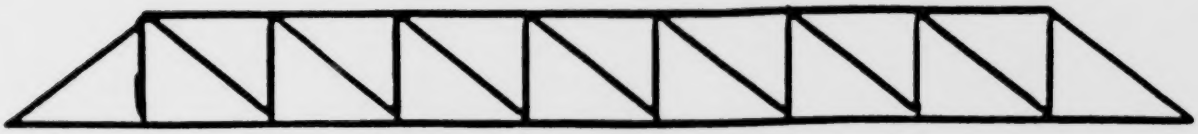


Diagonal Pattern

The diagonal cross members go on the face of each cube.

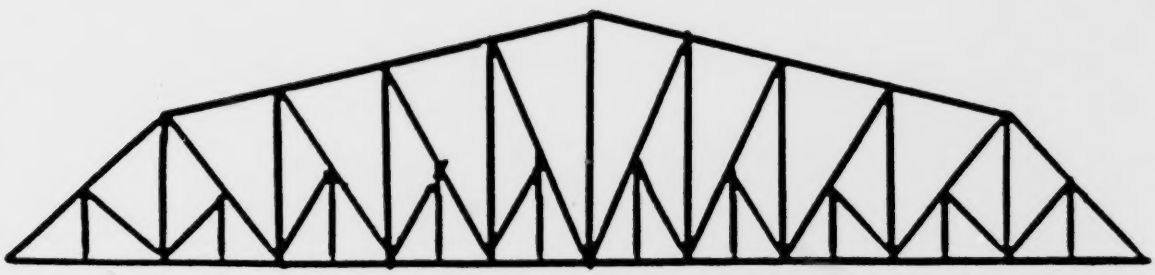


BRIDGE TYPES



PRATT TRUSS

WARREN TRUSS

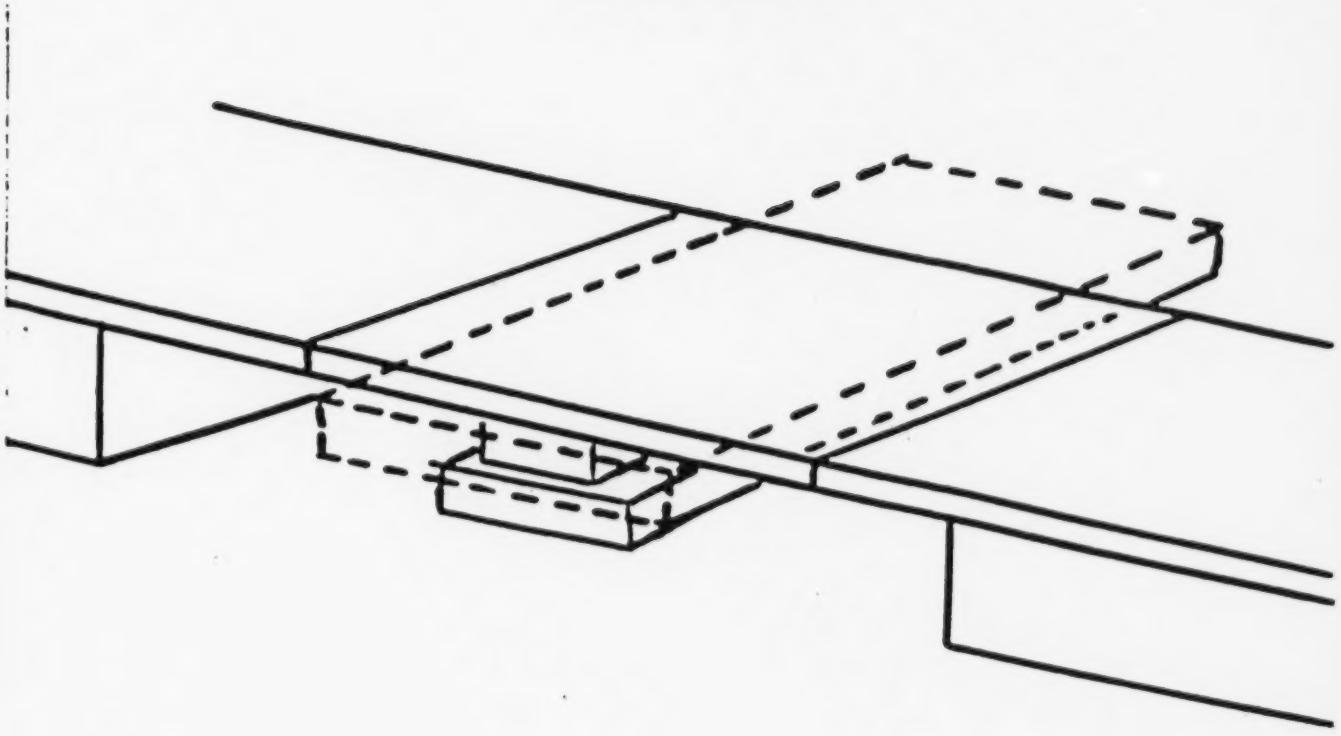


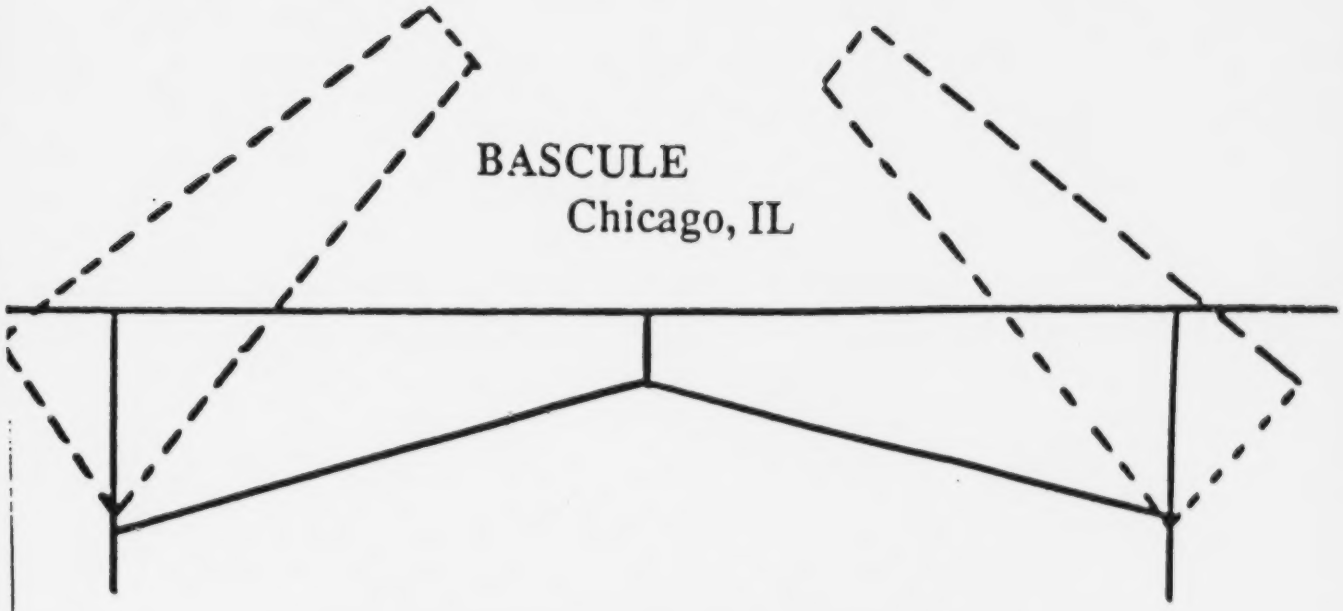
PETIT OR PENNSYLVANIA

CANTALEVER

BEST COPY AVAILABLE

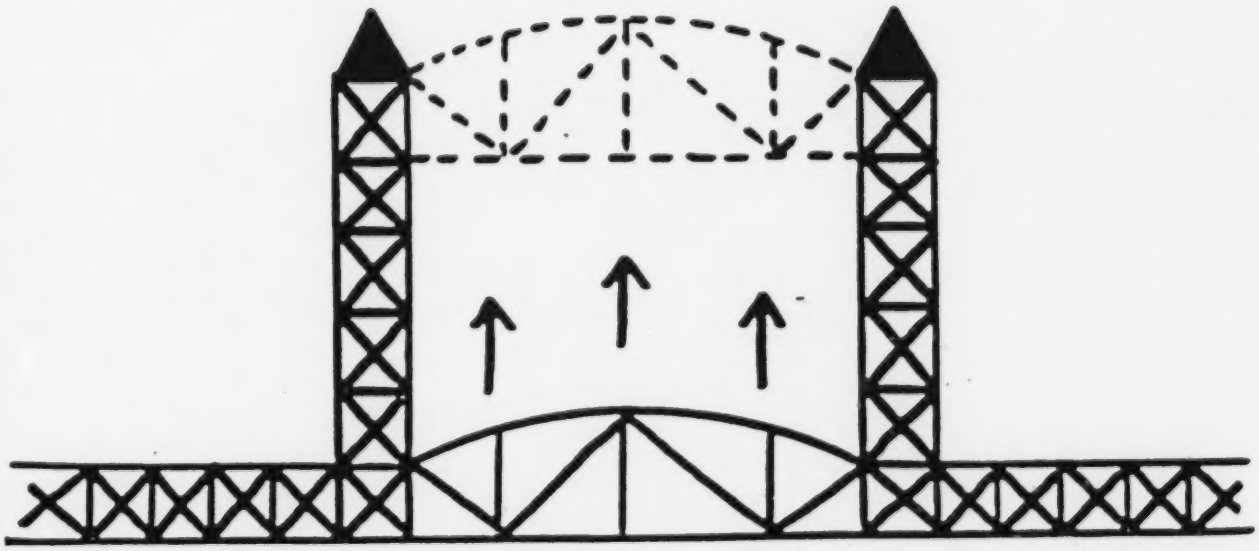
SWING SPAN
Yorktown, VA





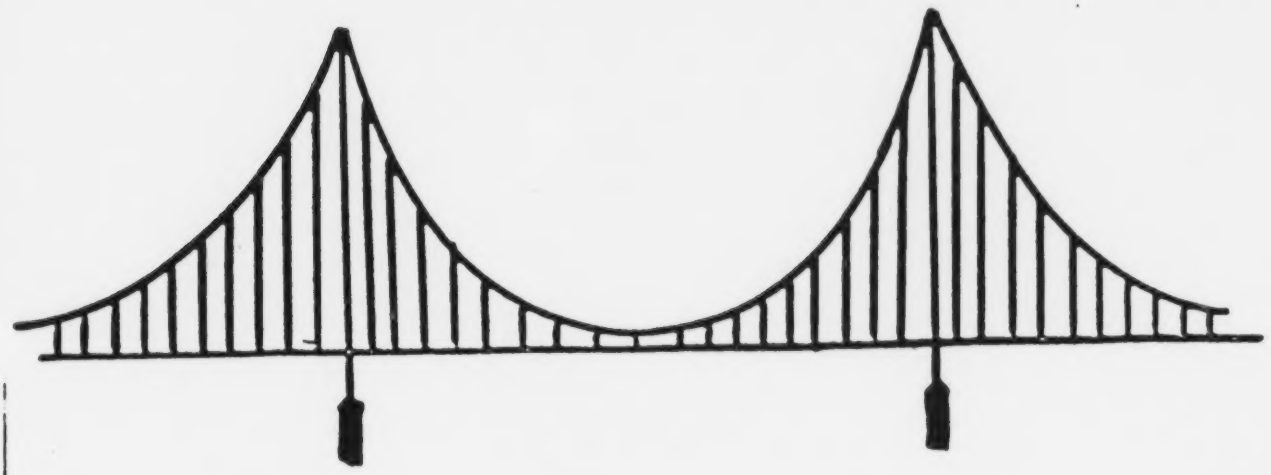
BASCULE
Chicago, IL

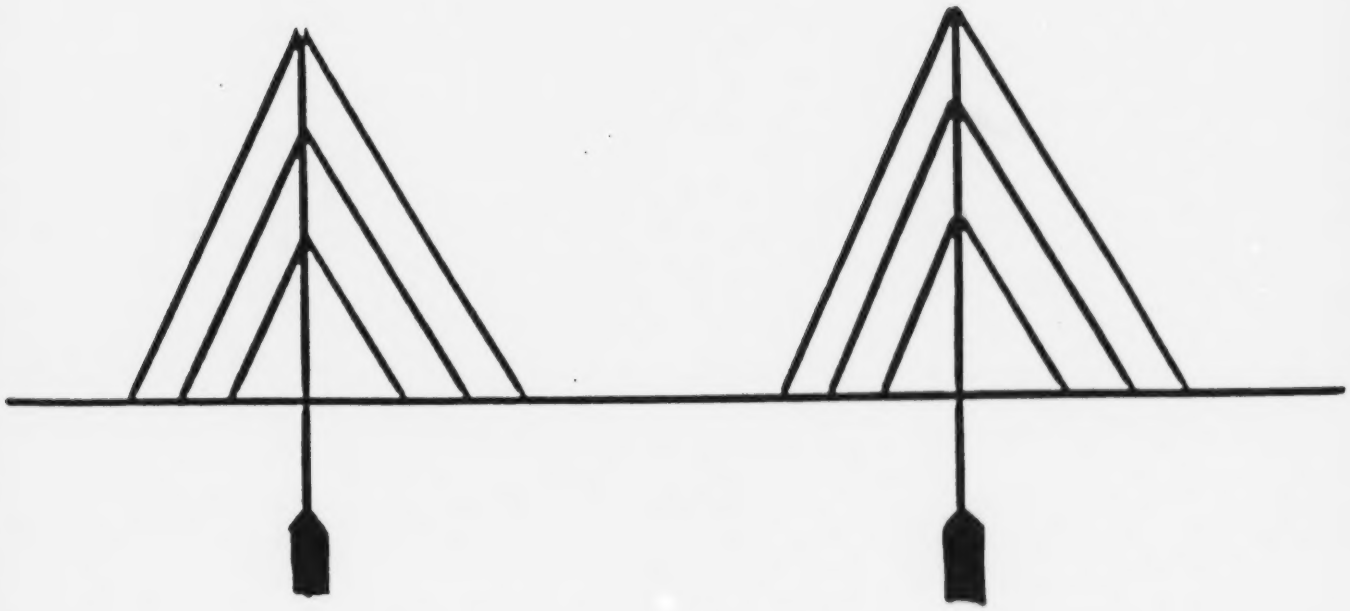
MOVEABLE BRIDGES



VERTICLE LIFT BRIDGE
Cape Cod, MA

SUSPENSION BRIDGES





THE ULTIMATE SURVEY

THE OSU FOOD SERVICE

THE ULTIMATE SURVEY - THE OSU FOOD SERVICE SYSTEM

PROBLEM: What do people think about the food service:

MATERIALS:

Clip Board
Pencil
Three Survey Sheets
Summary Tabulation Sheet
Your Terrific Personality

PROCEDURE:

You are going to have an opportunity to be an interviewer and gather information about OSU food preference. You will be working with a partner. We shall do some role play simulations in class before you do the real thing. Surveys are conducted for many reasons. Being an official interviewer is really fun and interesting.

Here are some tips in order to be a great interviewer:

1. Ask if the individual would be willing to participate in a food preference survey which will take only a few minutes?

2. Interview Young Scholars and other users of the food service in the Young Scholar program.

3. Interview three (3) people. Do each person one at a time. Do not interview a group.

4. Tabulate your data. You will have some guidelines from your teachers on how to do this.

5. It's time to start. Have a great time. You are going to meet some new people and learn about their opinions. Do not influence them with your opinions. We are doing a survey in order to discover what other people think about the food service.

Name_____

Tabulation of OSU Food Service Survey

1. Which questions are easier to summarize?

Why?

2. How can the data you have be summarized? You have at least five people you interviewed. How can you summarize not only your information but other data from your peers?

3. Develop a chart which might be used to summarize your data. Try it out with your data. Does it work well? Why or why not?

4. Use a clean copy of your questionnaire to summarize. Does it work? What are the advantages of each method?

THE ULTIMATE FOOD SURVEY

1. Gender: Male_____ Female_____

2. Grade level (beginning in September): ___8___9___10___11___12

Which dinner time foods do you like best?

Rate your selections from 0-4, with 4 being the highest. Under "others" please cite any food in that group you feel should be there.

Meats

beef w/ gravy____

steak____

hamburgers____

corn beef____

beef/barbecued____

beef/any style_____

other_____

ham/any style_____

pork chops_____

pork/any style____

lamb chops_____

veal_____

lamb/any style_____

other_____

Seafood

fish/baked____

fish/fried____

fish/any style____

shrimp/steamed____

shrimp/fried_____

shrimp/any style

clams/fried_____

other_____

THE ULTIMATE FOOD SURVEY

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Meats

beef w/ gravy____

steak____

hamburgers____

corn beef____

beef/barbecued____

beef/any style_____

other_____

ham/any style_____

pork chops_____

pork/any style____

lamb chops_____

veal_____

lamb/any style_____

other_____

Seafood

fish/baked____

fish/fried____

fish/any style____

shrimp/steamed____

shrimp/fried_____

shrimp/any style

clams/fried_____

other_____

THE ULTIMATE FOOD SURVEY

1. Gender: Male_____ Female_____

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Which dinner time foods do you like best?

Rate your selections from 0-4, with 4 being the highest. Under "others" please cite any food in that group you feel should be there.

Meats	Seafood
beef w/ gravy____	fish/baked____
steak____	fish/fried____
hamburgers____	fish/any style____
corn beef____	shrimp/steamed____
beef/barbecued____	shrimp/fried_____
beef/any style_____	shrimp/any style
other_____	clams/fried_____
ham/any style_____	other_____
pork chops_____	
pork/any style____	
lamb chops_____	
veal_____	
lamb/any style_____	
other_____	

Poultry

chicken/fried_____

chicken/baked_____

chicken/BBQ_____

chicken/any style_____

turkey/any style_____

other_____

Vegetables

corn_____

corn-on-the-cobb_____

carrots____

broccoli_____

zucchini_____

asparagus_____

spinach____

cabbage_____

greens/collards_____

greens/turnips_____

greens/mustard_____

greens/kale_____

tomatoes/stewed_____

cauliflower_____

string beans_____

rice_____

beets_____

other_____

Breads

white_____

rye_____

wheat_____

fresh baked rolls____

biscuits_____

other_____

Soups

vegetable_____

tomato_____

French onion_____

clam chowder_____

mushroom_____

chicken noodle_____

other_____

Fruit/fresh

apples_____

oranges_____

banana_____

pears_____

melons_____

other_____

_____

_____

Poultry

chicken/fried_____

chicken/baked_____

chicken/BBQ_____

chicken/any style_____

turkey/any style_____

other_____

Vegetables

corn_____

corn-on-the-cobb_____

carrots____

broccoli_____

zucchini_____

asparagus_____

spinach____

cabbage_____

greens/collards_____

greens/turnips_____

greens/mustard_____

greens/kale_____

tomatoes/stewed_____

cauliflower_____

string beans_____

rice_____

beets_____

other_____

Breads

white_____

rye_____

wheat_____

fresh baked rolls____

biscuits_____

other_____

Soups

vegetable_____

tomato_____

French onion_____

clam chowder_____

mushroom_____

chicken noodle_____

other_____

Fruit/fresh

apples_____

oranges_____

banana_____

pears_____

melons_____

other_____

_____

_____

Poultry

chicken/fried_____

chicken/baked_____

chicken/BBQ_____

chicken/any style_____

turkey/any style_____

other_____

Vegetables

corn_____

corn-on-the-cobb_____

carrots____

broccoli_____

zucchini_____

asparagus_____

spinach____

cabbage_____

greens/collards_____

greens/turnips_____

greens/mustard_____

greens/kale_____

tomatoes/stewed_____

cauliflower_____

string beans_____

rice_____

beets_____

other_____

Breads

white_____

rye_____

wheat_____

fresh baked rolls____

biscuits_____

other_____

Soups

vegetable_____

tomato_____

French onion_____

clam chowder_____

mushroom_____

chicken noodle_____

other_____

Fruit/fresh

apples_____

oranges_____

banana_____

pears_____

melons_____

other_____

_____

_____

Fried Vegetables

onion rings_____

zucchini_____

cauliflower_____

Other_____

Canned Fruit

apple sauce_____

peaches_____

pears_____

fruit cocktail_____

other_____

Salad Bar

overall_____

item(s) you would

like added_____

_____

_____

item(s) you would like

removed_____

_____

_____

Beverages

orange juice_____

apple juice_____

cranberry_____

white milk_____

chocolate milk_____

soda_____

water_____

other_____

_____

Special orders

_____

_____

_____

_____

_____

_____

Desserts

_____

_____

_____

_____

_____

_____

Fried Vegetables

onion rings_____

zucchini_____

cauliflower_____

Other_____

Canned Fruit

apple sauce_____

peaches_____

pears_____

fruit cocktail_____

other_____

Salad Bar

overall_____

item(s) you would like added_____

_____

_____

item(s) you would like removed_____

_____

_____

Beverages

orange juice_____

apple juice_____

cranberry_____

white milk_____

chocolate milk_____

soda_____

water_____

other_____

_____

Special orders

_____

_____

_____

_____

_____

_____

Desserts

_____

_____

_____

_____

_____

_____

Fried Vegetables

onion rings_____

zucchini_____

cauliflower_____

Other_____

Canned Fruit

apple sauce_____

peaches_____

pears_____

fruit cocktail_____

other_____

Salad Bar

overall_____

item(s) you would like added_____

_____

_____

item(s) you would like removed_____

_____

_____

Beverages

orange juice_____

apple juice_____

cranberry_____

white milk_____

chocolate milk_____

soda_____

water_____

other_____

_____

Special orders

_____

_____

_____

_____

_____

_____

Desserts

_____

_____

_____

_____

_____

_____

THE ULTIMATE FOOD SURVEY : FOLLOW UP

1. With the help of your teacher tabulate, summarize, and graph the data indicated by your surveys.

2. Using all of the data you have combined design a dinner time menu for the following:

a. 8th grade females.

b. 8th grade males.

c. 9th grade males and females.

3. Submit your proposed menu to (3) members of each of the above groups.

4. In 100 words or more, write a summary of the overall results of the survey in general. Include the results of your proposed menu.

Genetics

Genetics

Problem

What are some human genetic traits?

Human traits are difficult to study because of the relatively long human lifespan and the limited number of human offspring. In addition, the number of chromosome pairs (23) increases the possible genetic combinations.

However, it is possible to take a sample of a human population to find the frequency of a trait and the possible ways a given trait is inherited.

Materials

PTC paper
Pencil
Paper

Red Blood Cells
White "
Platlets
Plasma

Procedure

Investigation

(A) Read the short description of each of the following traits. Determine which trait you have (your phenotype). Record your findings in the Data Sheet Table. In recording your genotype, use only a single symbol to indicate dominance since you do not know whether you are homozygous or heterozygous for the trait.

(1) *Attached Earlobe*: In most people the earlobes hang free. But when a person is homozygous for a certain recessive gene (e), the earlobes are attached directly to the side of the head.

(2) *Widow's Peak*: In some people the hairline drops downward and forms a distinct point in the center of the forehead. This is known as a widow's peak. It results from the action of a certain dominant gene (W).

(3) *Tongue Rolling*: A dominant gene (R) gives some people the ability to roll the tongue into a "U" shape when the tongue is extended from the mouth. Nonrollers (r) can do no more than produce a slight downward curve of the tongue.

(4) *Bent Little Finger*: A dominant gene (B) causes the last joint of the little finger to bend inward toward the fourth finger. Lay both hands flat on the table, relax the muscles, and note whether you have a bent or straight little finger.

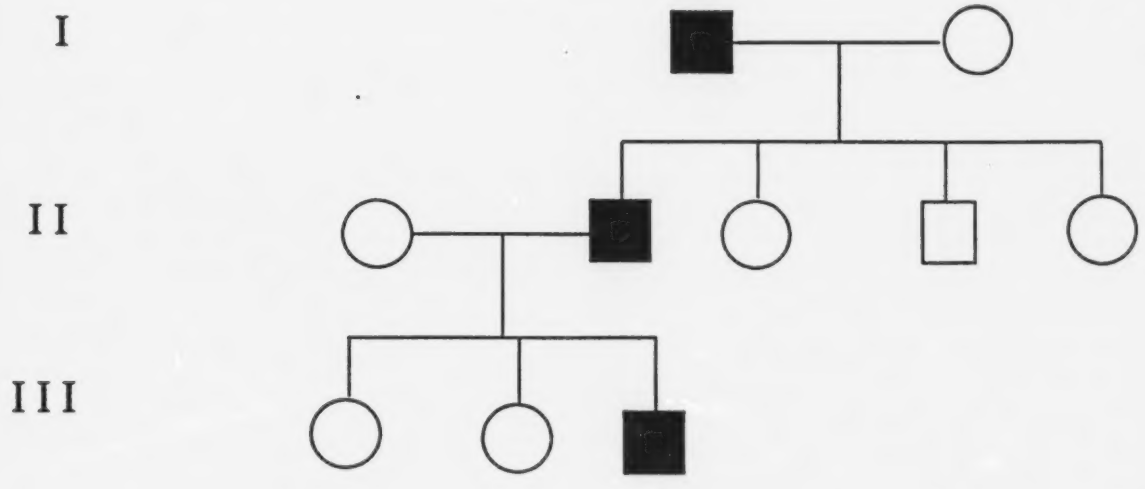
(5) *PTC Tasting*: Place a piece of PTC paper on your tongue. If you detect no obvious taste, you are a nontaster and are homozygous for a recessive gene (t). The tasting of this chemical results from the presence of a dominant gene (T).

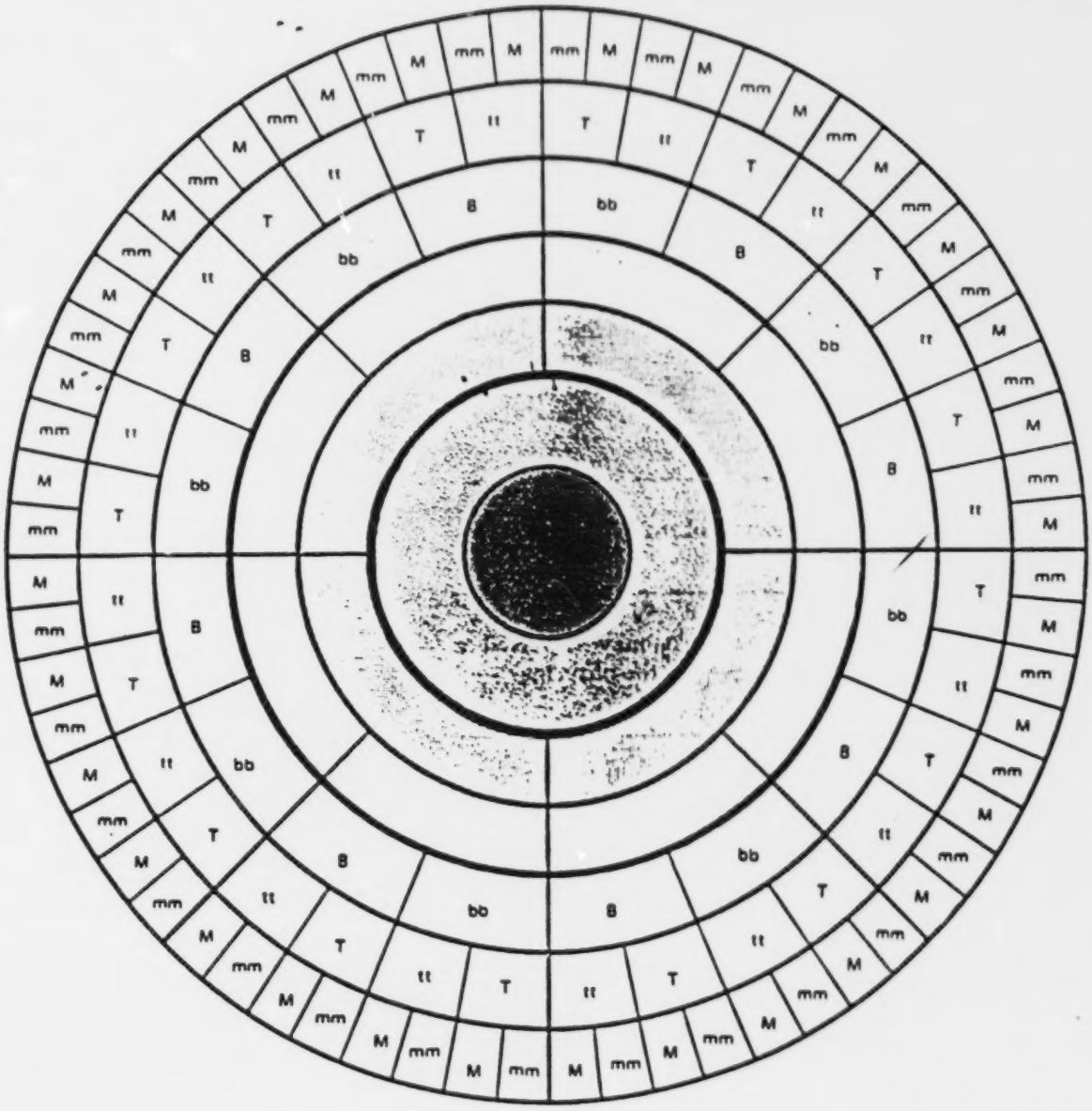
Your teacher will compile the data from the entire class or classes. Record these figures on your Data Sheet Chart.

(B) On your Data Sheet, page 68, the figure of the genetic circles permits you to visualize how much human genetic traits vary. In the center of the circle, enter the number of individuals in your class. Work from the middle to the outside. Using the data from the table in **A**, enter the number of individuals with free earlobes (E) in the proper space in the next circle. Enter the number of students with attached earlobes in the proper space. Continue outward, dividing the group by each trait and indicating the number in each group. If you wish, you may extend the section by adding another trait.

Investigations On your Own

Prepare a pedigree of your family's ability to roll their tongues or a pedigree of one of the other characteristics studied in this Investigation. Construct the pedigree representing two generations beginning with your parents and their offspring (which would include you). A square is used to represent a male, and a circle, a female. Shading either square or circle indicates the possession of the recessive trait. Each generation is indicated by a Roman numeral. The squares and circles are joined by lines indicating relationships. Pedigrees may be expanded to include as many generations and relationships as are desired and available for testing. Review the pedigree shown (in outline form) to understand how relationships may be indicated.




mm
M
tt
T
bb
B

Data Sheet for Investigation A

Trait	Your Genotype	Dominant	Recessive	Ratio	Frequency (%) of Your Trait
Earlobes					
Widow's Peak					
Tongue Rolling					
Bent Little Finger					
PTC Tasting					

Questions

B Fill in the genetic circle chart on the opposite page.

1. How would it help to extend the outermost section by adding another trait?

_____

2. If you had to keep extending the traits, how many more could you add? _____

_____

3. Why are there always two choices as you move to each step? _____

_____

_____

4. If two people ended up on the same outer space, would they look alike? _____

_____

5. If you had 100 circles, would these two people look alike? _____

_____

6. Could two parents who are tasters have a child who is a nontaster? Explain. _____

_____

_____

7. How do the ratios obtained for the characteristics observed compare to the national average? The national average is 65% for PTC tasting and tongue rolling and 35% for nontasters and nonrollers.

_____

_____

8. How could you account for a variation from the national averages? _____

_____

_____

_____

Other Traits That May Be of Interest

1. Eyelid shape	Oriental eyeshape is dominant. Caucasian or negro eye shape is recessive.
2. Position of Teeth	Space between top front teeth is dominant. No space is recessive.
3. Hair on fingers	Hair on middle part only of one or several fingers is dominant. No hair on middle part of fingers is recessive.
4. White hair	A patch or streak of white hair is dominant. No patch of white hair is recessive.
5. Number of fingers	Having six fingers is dominant. Having five fingers is recessive.
6. Eye color	All dark eye colors are dominant. Blue or gray eye color is recessive.
7. Handedness	If you are right handed, this is dominant. If you are left handed, this is recessive.
8. Hair color	Not having red hair is dominant. Having red hair is recessive.

TOXIC WASTES IN A SYSTEM

TOXIC WASTE ACTIVITY SHEET

1. Describe how you developed your system with two landfill items.

2. Describe what you observed as the simulated toxic wastes moved into and through your system?

3. How does the simulated toxic wastes react with your different materials?

4. Did your monitoring well detect any toxic wastes? If so, how long did it take? MINUTES_____SECONDS_____

5. Compare your systems with two others in the class. Smell it, look at it (visual), and find any similarities or differences. Make a list of your comparison observations.

6 Compare and rate your system with others in class.:

a. No improvement Little Imp. Some Imp. Great Improvement

List their items used in the landfill.

b. No improvement Little Imp. Some Imp. Great Improvement

List their items used in the landfill.

c. No improvement Little Imp. Some Imp. Great Improvement

List their items used in the landfill.

6. What are the challenges with toxic waste products:

7. What needs to be done to help solve this problem?

8. COMMENTS

TOXIC WASTES IN A SYSTEM

PROBLEM: What can be done to limit the movement of toxic waste in an earth system?

MATERIALS
plastic cups
shredded wheat
cotton balls
shredded newspaper
sand
gravel
soil
granulated charcoal
marble chips
vermiculite
filter paper
1 cup of simulated toxic fluid

PROCEDURE:

1. Introduction-Toxic waste disposal worldwide has become quite a problem and will continue to be one as long as these wastes are produced. Used oil drained from cars is considered a waste product which should not be dumped into the environment. Industry is also challenged to dispose of wastes. Do we bury, incinerate, or recycle? These are difficult problems with no easy solutions. Landfills may allow these wastes to find their way into our drinking supplies. Cities are busy burying wastes. This lab will give you an opportunity to explore the movement of liquids through various materials which might be found in a landfill.

2. You will need to work with a partner. Obtain your plastic container and line it with filter paper as demonstrated in class. This filter paper will act as your monitoring well and represent the underground water table.

3. Have you engineered the waste site well enough to protect the ground water from becoming contaminated?

4. A variety of supplies for your landfill are provided in the classroom. SELECT ONLY TWO ITEMS TO USE IN YOUR LANDFILL.

5. After you have created your site, you are ready for the waste test. Pour 1/2 cup of simulated toxic waste onto the surface of the site. Record your observations.How long did it take for the filter paper to obtain the simulated toxic waste?

6. How might you decide if your project protected the water supply?

7. Use the Laboratory Activity Sheet to record your observations and make some inferences or predictions.